REMARKS

INTRODUCTION

In accordance with the foregoing, claim 2 has been canceled, and claims 1, 3, and 4 have been amended. No new matter is being presented, and approval and entry are respectfully requested.

Claims 1, 3, and 4 are pending and under consideration. Reconsideration is respectfully requested.

INTERVIEW SUMMARY

On February 11, 2005, Applicant's Representative notified the Examiner of a discrepancy and noted that the Office Action was confusing. Specifically, U.S. Patent No. 5,442,773 was incorrectly listed as a reference on the PTO-form 892. U.S. Patent No. 5,442,733 was not listed on the PTO-form 892, and is the primary reference in the Office Action. Further, Applicant requested a new start date, and the Examiner has responded by issuing a supplemental Office Action.

OBJECTION TO CLAIM 4

In the Office Action at page 2, numbered item 2, claim 4 was objected to because of informalities. Claim 4 has been amended to correct those informalities. Accordingly, Applicant respectfully requests withdrawal of the outstanding objection to claim 4.

REJECTIONS UNDER 35 U.S.C. §112

In the Office Action at pages 2-3, numbered items 4-7, claims 1-4 were rejected under 35 U.S.C. §112, second paragraph, for the reasons set forth therein. This rejection is traversed and reconsideration is requested.

Claim 2 has been cancelled and claims 1, 3, and 4 have been amended to provide sufficient antecedent basis for the limitations in the claims. Accordingly, Applicant respectfully requests that the rejections of claims 1, 3, and 4 be withdrawn.

REJECTION UNDER 35 U.S.C. §103

In the Office Action at pages 3-5, numbered item 9-11, claims 1 and 3 were rejected under 35 U.S.C. §103 over U.S. Patent No. 5,442,733 to Kaufman, et al. in view of U.S. Patent No. 5,305,430 to Glassner. The reasons for the rejection are set forth in the Office Action and therefore not repeated. The rejection is traversed and reconsideration is requested.

Independent claim 1 is directed to a method for rendering using symplectic ray tracing, and includes practicing symplectic ray tracing. Independent claim 1 has been amended to recite that practicing symplectic ray tracing includes "deriving a pre-stored Hamiltonian corresponding to the object," "acquiring all derivatives of the Hamiltonian by applying fast automatic differentiation techniques," "forming a Hamilton's canonical equation," and "practicing symplectic integration by applying a symplectic Euler method to the formed Hamilton's canonical equation." Independent claim 3 has been amended to recite similar features. Support for the amendments to independent claims 1 and 3 can be found in the originally filed specification at pages 8-9.

Applicant respectfully submits that both Kaufman and Glassner fail to teach or suggest at least "deriving a pre-stored Hamiltonian corresponding to the object," "acquiring all derivatives of the Hamiltonian by applying fast automatic differentiation techniques," "forming a Hamilton's canonical equation," and "practicing symplectic integration by applying a symplectic Euler method to the formed Hamilton's canonical equation," as recited in amended independent claim 1. Amended independent claim 3 includes similar features. Further, Applicant respectfully submits that these features are not required for the classical ray tracings of Kaufman and Glassner. Rather, these features of amended independent claims 1 and 3 allow for the consideration of orbits of a curved light ray as in, for example, mirages and gravitational lenses.

For at least this reason, Applicant respectfully submits that Kaufman and Glassner, taken alone or in combination, fail to teach all of the features of amended independent claims 1 and 3. Accordingly, Applicant respectfully submits that amended independent claims 1 and 3 patentably distinguish over the prior art and are in condition for allowance.

In the Office Action at pages 5-6, numbered item 12-14, claims 2 and 4 were rejected under 35 U.S.C. §103 over Kaufman and Glassner in view of U.S. Patent No. 5,442,733 to Chen, et al. The reasons for the rejection are set forth in the Office Action and therefore not repeated. The rejection is traversed and reconsideration is requested.

Claim 2 has been cancelled. Claim 4 depends directly from amended independent claim 3 and patentably distinguishes over Kaufman and Glassner for at least the reasons set forth above. Chen teaches manipulation of a three-dimensional object displayed on a computer screen. The present invention, in contrast, quickly and accurately forms Hamilton's canonical equation to accurately determine the orbit of a light ray.

According to Chen at col. 11, lines 45-50, the word "canonical" means that the planes/faces of the bounding box are perpendicular to the coordinate axes. Chen's use of canonical conditions in three-dimensional space provides for convenience of calculation. As

noted in Chen, canonical conditions can be produced by using 4x4 modeling transformation. The present invention, in contrast, does not require that the planes/faces of the bounding box are perpendicular to the coordinate axes because Hamilton's canonical equation is formulated in coordinate-free form. Further, while Chen provides a calculation method for three-dimensional space, the present invention provides for an n-dimensional phase space that is constructed from location and momentum. Thus, Chen cannot form a Hamilton's canonical equation quickly, especially when the Hamiltonian has a complicated form, and Chen cannot quickly and accurately determine the orbit of a ray of light.

Chen also fails to teach or suggest "deriving a pre-stored Hamiltonian corresponding to the object," "acquiring all derivatives of the Hamiltonian by applying fast automatic differentiation techniques," "forming a Hamilton's canonical equation," and "practicing symplectic integration by applying a symplectic Euler method to the formed Hamilton's canonical equation," as recited in amended independent claim 3, from which claim 4 depends. Accordingly, Kaufman, Glassner, and Chen, taken alone or in combination, fail to teach or suggest all of the features of amended dependent claim 4 and, therefore, claim 4 patentably distinguishes over the prior art and is in condition for allowance.

CONCLUSION

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot. And further, that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited.

If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited by the Examiner contacting the undersigned attorney for a telephone interview to discuss resolution of such issues.

If there are any underpayments or overpayments of fees associated with the filing of this Amendment, please charge and/or credit the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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